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KERR-McGEE CHEMICAL, LLC
TOLEDO TIE TREATMENT SITE
TIME CRITICAL REMOVAL ACTION REPORT

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1.0 INTRODUCTION

Kerr-McGee Chemical Corporation, now known as Kerr-McGee Chemical, LLC (KMC), was issued a Unilateral Administrative Order (UAO), on December 24, 1997, pursuant to Section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The UAO pertains to the former Toledo Tie Treatment Site (Site) located in and near the Arco Industrial Park in Toledo, Ohio. *Section V, Item 3.5) and Item 3.7), respectively of the UAO dictate that KMC:*

- *Remove the immediate source areas of hazardous substances or implement engineering controls to prevent the contamination in the source areas from migrating to Williams Ditch and to the surface of Frenchmens Road,* and

- *Remove coal tar creosote contamination from Williams Ditch sediments and/or implement additional engineering controls to prevent continued release of contaminants to Williams Ditch.*

KMC entered into a contract with IT Corporation (IT) formerly known as OHM Remediation Services (OHM), to complete the time critical activities at the Site. IT Group is a holding company and the contract was amended to reflect this. The contractor is hereafter referred to as IT. Removal actions taken to fulfill Items 3.5) and 3.7) of the UAO, inclusive of preparatory and project closeout tasks, were completed between September 1998 and September 1999. Final electrical service, to support remote monitoring of the Site, was established in February 2000. Pursuant to Section V, Item 3.6 of the UAO, this report documents removal actions taken to fulfill Section V, Items 3.3), 3.5) and 3.7) of the UAO. Documentation of Section V, Items 3.1), 3.2), 3.4) and 3.6) are described in a previously submitted document, "Time Critical Removal Plan for the Toledo Tie Treatment Site", HAI document #PWM001.100.0063.

1.1 Report Organization

This report is organized into four sections to document time-critical removal activities at the Site. Section 1.0 presents an overview of the site and a general chronological narrative of project events. Section 2.0 discusses the removal actions, including their effectiveness and any difficulties encountered. Section 3.0 describes observations during site investigation and removal activities related to the distribution of creosote related contamination. Section 4.0 addresses a good faith estimate of the costs associated with responding to the UAO. Figures, tables, and plates are provided for supporting documentation, in addition to project photographs. Record drawings documenting the removal action are located in Appendix A. Where applicable, this report conforms to the format prescribed in 40 CFR §300.165 of the National Contingency Plan (NCP).

1.2 Summary of Events

The United States Environmental Protection Agency (US EPA) ordered KMC, on December 24, 1997, to conduct certain time critical removal actions to address the environmental impacts of former wood treating operations at the Site on Williams Ditch. Figures 1 through 3 show the Site's geographic location and the general removal action work areas. The effective date of the UAO was January 27, 1998. Prior to the effective date of the UAO, beginning on October 10, 1997, at the oral request of US EPA representatives, KMC conducted voluntary efforts to contain and recover suspected oil sheen observed in Williams Ditch. The events leading up to the issuance of the UAO, including those items required by 40 CFR §300.165 (c)(1)(i)-(vi), are documented in Section IV of the UAO and also the Administrative Record, the index of which is Attachment A to the UAO. Appending to this summary of events, the following are key project activities conducted by KMC to fulfill the requirements of the time critical portion of the UAO.

Key Project Activities:

- **January 1998**. Recovery and containment of sheen continues. KMC continues to negotiate site access agreements.

- **February 1998**. The City of Toledo closes Frenchmens Road to through traffic and places concrete traffic barriers at the corner of Frenchmens Road and Arco Drive. Concurrently, the City of Toledo Division of Environmental Services posts warning signs at several locations along Williams Ditch.

- **February 1998 to April 1998**. Preparation of the Removal Action Work Plan (HAI document #PWM001D.002), Appendix A, Field Sampling and Analysis Plan (HAI document #PWM001D.003) Appendix B, Health & Safety Plan (HAI document #PWM001.100.0097), and Quality Assurance Project Plan, (HAI document #PWM001D.001). Two iterations occurred and the final documents were approved by US EPA on April 29, 1998. Work commenced immediately.

- **April and May 1998**. Identification and investigation of potential source areas, including soil, sediment, water and air sampling. The results of this investigation are documented in KMC's document titled "Time Critical Removal Plan for the Toledo Tie Treatment Site", August 1998 (HAI document #PWM001.100.0063).

- **July 1998**. First draft of time critical removal plan to US EPA.

- **August 1998**. Additional air sampling conducted. Results from the May 1998 and August 1998 sampling events are documented in a report titled "Results of Ambient Air Monitoring at the Toledo Tie Treatment Site," August 21, 1998, prepared by Derenzo and Associates, Inc.

- **August 1998**. Final time critical removal plan submitted to and accepted by the US EPA. Refer to HAI document #PWM001.100.0063.

- **September 1998**. Commencement of project by IT with initiation of utility relocation and mobilization onto the Site.

- **October 1998**. Coordination of utility relocation, IT mobilization.

- **October 1998-June 1999**. Williams Ditch by-pass and water treatment

- **October 1998-July 1999**. Air monitoring and sampling during excavation and waste handling activities.

- **November 1998**. Identification of suspected infiltration of creosote related contamination into storm sewers along Arco Drive, south of Frenchmens Road. Cleaning and videotaping was completed by an IT subcontractor. Also, twin 48-inch concrete culverts under Arco Drive and storm sewers at the east end of the work area along Frenchmens Road were inspected.

- **November 1998-May 1999**. Excavation and disposal of approximately 29,500 tons of impacted soil and sediment from Williams Ditch and the suspected former lagoon areas.

- **November 1998-July 1999**. Removal, replacement and/or rehabilitation of infrastructure components, including storm sewers, a water line and approximately 500 feet of Frenchmens Road.

- **June 1999**. Approximately 1020 feet of Williams Ditch was enclosed using 74-inch diameter, high density polyethylene pipe as an engineering control to prevent the possible migration of residual creosote contamination into the waters of Williams Ditch.

- **June 1999-August 1999**. Overall site regrading and restoration.

- **August 1999**. Frenchmens Road is reopened.

- **September 1999**. IT completes demobilization.

- **October 1999**. Final pre-wiring for telemetry unit completed. Awaiting final service connection from Toledo Edison.

- **February 2000**. Final service connection from Toledo Edison and programming of the dial up unit.

Initiation of the non-time critical removal action, the Engineering Evaluation/Cost Analysis (EE/CA), required in Section V, Item 3.8 of the UAO is expected to commence in the first quarter of 2000.

1.3 Threat Abatement

Initial abatement of the threat of off-site migration of oil or oil sheen was taken by KMC through the following actions:

1. Voluntary installation of a series of absorbent and floating "hard" booms to contain oil or oil sheen within the Site.

2. Regular recovery from and monitoring of oil sheen on the surface of the water in Williams Ditch.

3. Installation of an engineered system of siphon dams, in addition to Item 1 above, to provide an additional measure of protection against potential off-site migration.

4. The City of Toledo, Traffic Engineering Department, placed concrete barriers at the corner of Frenchmens Road and Arco Drive and closed Frenchmens Road to through traffic, restricting uncontrolled access to the Site. Consistent with the Removal Action Work Plan, approved by the US EPA on April 29, 1998, KMC established additional security measures at the Site by placing fencing around the perimeter of the suspected former lagoon area and the most heavily impacted areas of Williams Ditch. The location and nature of these security measures is shown on Figure 5 of the Removal Action Work Plan, April, 1998. A sign in/sign out procedure was established and access to the site was controlled by KMC.

1.4 Treatment/Disposal/Alternative Technology Approaches

KMC elected to pursue excavation and landfilling of contaminated soils and sediments. Initial volume projections, coupled with the time critical nature of the removal activities and the geologic characteristics of the impacted materials, made this option most feasible from a time and cost-effectiveness standpoint. Other options included incineration, thermal desorption, and in-situ treatment/active product extraction. Implementation of these options were not selected by KMC for they were either too labor or time intensive to effectively address the environmental and public health threat described in the UAO, in a timely manner. Consideration was also given to the disruption of local businesses created by an extended presence on the site. Source removal, coupled with the application of engineering controls was deemed the most expeditious and effective method to address the imminent threat to public health and the environment.

1.5 Public Information and Community Relations Activities

KMC organized and presented the results of site investigation activities, along with the planned removal activities to the tenants of Arco Industrial Park on September 10, 1998. Individual business and property owners, the US EPA and representatives of the City of Toledo were invited to attend. The objective of this informational meeting was to advise business owners and property owners of the nature, scope and anticipated duration of the planned removal activities. In addition, it provided a forum for interested parties, who were likely to be effected by the removal action, to ask questions and provide input into measures to minimize disruption to business. An informational summary was prepared and made available to interested parties. Copies of the information disseminated are in Appendix B. Similar documents, patterned after KMC's presentation, were also prepared by the US EPA and distributed to tenants of the industrial park and interested citizens groups.

As requested, KMC's project coordinator provided information regarding the status of the time critical removal to interested parties, including the Mayor's Environmental Council (City of Toledo). KMC maintained steady communications with the effected business owners during the course of the time-critical removal and met with the property owners individually, on an as needed basis, to share information regarding the project and respond to concerns.

Upon substantial completion of the time-critical removal portion of the project, KMC coordinated and conducted a second informational meeting for the Arco Industrial Park tenants, landowners and other interested parties. This meeting was held on August 31, 1999, to discuss the time critical removal actions and review expectations for the non-time critical phase of the project.

2.0 REMOVAL ACTIONS

The time critical removal actions included containment and recovery of oil or oil sheen from Williams Ditch; the excavation and disposal of immediate source material in the suspected former lagoon area, as defined in Section 4.1.1 of the Time Critical Removal Plan, August 1998 (HAI document #PWM001.100.0063) and as amended by the US EPA On-Scene Coordinator, by letter dated April 15, 1999; installation of a subsurface barrier to minimize potential migration of any residual contamination into areas where clean backfill had been placed; excavation of creosote contaminated sediment from Williams Ditch; installation of a 74-inch diameter high density polyethylene pipe as an engineering control to restore Williams Ditch; removal and restoration of infrastructure components, including a section of Frenchmens Road; and restoration of properties disturbed by the project. These components are described in the following sections.

2.1 Sheen Containment and Recovery

KMC began voluntary oil and oil sheen containment and recovery activities in October 1997 and continued this effort until the UAO became effective. Oil and oil sheen were then recovered from the water surface in Williams Ditch on a daily basis excluding weekends, until April 1998, at which time the US EPA approved KMC's request to modify the frequency of sheen collection. Sheen was thereafter collected 3 days a week, until the frequency was reduced to once per week, starting around May 15, 1998. Sheen collection was terminated in December 1998, when sediment removal began. Photographs of the sheen containment system and recovery activities are provided in Appendix C.

Oil sheen on the water's surface in Williams Ditch behaved similar to a extremely thin film, tending to dissipate or disperse when agitated by wind or high water flow. Typically, a "manta ray" attachment to a vacuum truck hose, was used to collect what oil sheen collected at the boom locations or siphon dam. Portable leaf blowers were used to direct the floating sheen to a collection point against either a siphon dam or floating "hard" marine boom. This method proved effective in collecting sheen, while minimizing the amount of water collected. The mixture recovered from Williams Ditch was essentially water, with a trace of oil or oil sheen in it. Analytical data from two separate sampling events are included in Appendix D-1. Samples were collected from drummed material at the initiation of sheen recovery and a second sample from water stored in a fractionation tank kept on-site. Approximately 424,315 gallons of sheen tainted water were disposed of at City

Environmental, Detroit, Michigan. Recovery efforts were performed by Heritage Environmental, Toledo, Ohio. Once IT mobilized onto the Site, any collected sheen was placed into the on-site water treatment plant.

2.2 Soil Removal

2.2.1 Suspected Former Lagoon Area Excavation

Two suspected former lagoons and a peripheral area between the suspected lagoons and the former distribution warehouse at 3227 Frenchmens Road were targeted for mass excavation. Approximately 18,600 tons of soil were excavated, staged, and shipped to Peoria Disposal Company's, (PDC) Peoria #1 Subtitle C landfill facility in Peoria, Illinois. Less than 1 percent of this total tonnage was clay soil used in clay dams during ditch dewatering activities. This soil was generally a wet to damp, sandy, silty, heterogeneous material. The ratio between cubic yards and tons, was estimated to be approximately 1.5. The area indicated on Plates A-1 and A-2 in Appendix A was excavated to an average elevation of 616. Certain areas, for example where an 8-inch waterline was replaced and a 27- inch concrete storm sewer was removed, were excavated to a greater depth, to approximately elevation 614.3 and 611.2, respectively. The total excavation area was 1.1 acres.

Surficial soils, from the surface to a depth approximately 2 to 3 feet below the surface, along with existing vegetation, not exhibiting visual signs of being saturated by a water/creosote mixture, or exhibiting the characteristics of "source material" as defined in the Time Critical Removal Plan, were stockpiled separately. Soils described as a brown, silty sand with a loamy texture, and existing vegetation were stripped off the top 1 to 2 feet. Underlying this layer, to approximately 2 to 3 feet was a darker, coarser material, dark brown to black , with a faint petroleum odor and containing an occasional "chunk" of what appeared to be dried creosote or possibly coal. Although there was a fairly distinct difference in the appearance of these two materials, the layers were slightly intermixed at the interface separating them. These materials were characterized for management purposes according to the process described in Section 2.5. Based on field measurements and estimated truck counts, approximately 1,900 tons of material in addition to subsurface soils from these surficial layers were disposed of at PDC's Subtitle C facility.

Excavation occurred within the area defined in the Time Critical Removal Plan, August 1998. The vertical excavation terminus, determined in the field, was the point where the immediate source, defined as free-flowing, creosote product or soils saturated with creosote product, was removed.

These soils were silty sand or silt and visually impacted. A distinct, free flowing zone of suspected creosote product, on the order of one to three inches thick, was observed at a fairly uniform elevation around the eastern, southern and western portion of the lagoon area excavation. It appeared that this zone rested on a continuous clayey soil layer. The excavation was carried approximately 6 to 12 inches below this zone into the underlying clayey soil.

The surveyed excavation depth was compared to the signature obtained during the Cone Penetrometer (CPT)/Laser Induced Fluorescence (LIF) investigation. A comparison between the base of the LIF signature and the depth of excavation is provided on Table 1. Isolated globules of creosote and/or discontinuous pockets of sand or silt lenses containing creosote may remain within the limits of the former lagoon area as the depth of excavation did not extend to the total depth of the LIF signature in all areas. A correlation between LIF signature and observed isolated globules of creosote within the underlying clayey soil layer was observed. Excavation within the limits of the former lagoon area however proceeded to within, on average, 6 to 18 inches of LIF signature terminus. At this depth, creosote was observed only in discontinuous globules, pinpoint to finger sized, within the underlying clay layer. A more detailed discussion of residual creosote related contamination is provided in Section 3.0.

Prior to backfilling the excavated lagoon areas however, there was no visual evidence across the bottom of the excavation south of Frenchmens Road of seepage from the floor. Where free flowing, creosote product or soils saturated with creosote product were observed at the perimeter of the excavation area, the impacted soils or product were removed to the extent practicable and a physical barrier placed at the perimeter terminus of the excavation. Excavation activities in and around the suspected former lagoon areas occurred periodically between November 1998, and April 1999. Photos of post-excavation conditions are included in Appendix C.

Beneath Frenchmens Road, there were areas where additional material within the continuous clay layer, was removed to address isolated, pinpoint to golf-ball sized globules of suspected creosote product. Excavation of this nature occurred prior to an on-site consultation between the US EPA and KMC occurred on March 31, 1999. This meeting resulted in the US EPA's modification to the work plan by letter dated April 15, 1999. Thereafter, discontinuous, pinpoint sized globules were allowed to remain, however, additional trenching measures into the underlying clayey soil were required and larger (i.e. softball sized) globules were ordered removed. These additional trenches occurred approximately every 20 feet horizontally and were anywhere from 3-5 feet in depth below the top of the continuous clayey soil layer. This practice continued until excavation activities were completed. Concurrence between the US EPA's oversight contractor and KMC was required on this issue during excavation and in general, was achieved. Test trenches conducted in this area revealed decreasing frequency and intensity of creosote globules with depth, down to approximately 8 to 9 below existing grade.

2.2.2 Lagoon Area Post-Excavation Sampling

After the immediate source had been removed, but prior to backfilling the area of the former lagoons, 9 samples from the base of the excavation were collected and analyzed for polycyclic aromatic hydrocarbons (PAHs), BTEX and metals. These data were not collected as confirmatory sampling, but rather in anticipation of conducting risk analyses during the EE/CA. The locations of these samples were selected randomly to present a generally even spatial distribution. Sample locations were selected before excavation began. The locations are shown on Figure 4 and the data tabulated on Table 2. Laboratory results are included in Appendix D-2.

2.2.3 Backfilling of Suspected Former Lagoon Area

Prior to placing backfill, a physical barrier was installed at the perimeter of the excavation, as described in the Time Critical Removal Plan, August 1998. The physical barrier was a minimum two-foot thick, compacted clay "plug", placed at the toe of the excavation sideslope and overlain by high-density polyethylene geomembrane (HDPE) panels, keyed into the underlying native clayey soil. The clay "plug" was compacted into place across the zone where the sandy, silty surficial material contacted the underlying clayey soil. The zone of free-flowing creosote was thus cut off from the areas where clean backfill was placed. Refer to details of the subsurface barrier on Plates A-2 and A-8 and Figure 5 for the layout of the HDPE panels. This barrier was placed in areas where clean off-site fill replaced excavated source material and impacted soils, as show on Sheet 3 of the Time Critical Removal Plan, August 1998. Clean, clayey soil backfill material was placed and compacted in the excavation using a Caterpillar D-4 or D-6 bulldozer. Loose lift thickness was on the order of 12 inches. Fill was placed in this manner to approximately the same grade as pre-removal conditions. Approximately 2 to 4 inches of topsoil was spread across the site and seeded using the mixture and procedures described in Ohio Department of Transportation (ODOT) Item 659.

Off-site materials, with the exception of aggregate used for the road subbase, rip rap and bedding for the Williams Ditch enclosure and storm sewer installation, were first chemically characterized for the same parameters and by the same methods used in the April and May 1998, field investigations of on-site soils. No chemical analyses on the aggregate were performed because of the known natural nature of the source. A total of five (5) different borrow sources were used. Clean, off-site materials brought to the site included excavation backfill, subgrade material for restoration of Frenchmens Road and backfill and cover soils for the Williams Ditch enclosure. Off-site materials included topsoil, clay soil, and granular material classified as ODOT 203, 310, 304, 57, and rip rap. The sources are summarized in Appendix D-3 along with geotechnical and geochemical data on the clean, off-site material. No volatile organic or semi-volatile organic compounds, pesticides, herbicides or PCB's were detected in any of the samples. Metals concentrations were within regional background values.

2.3 Sediment Removal

2.3.1 Williams Ditch Rerouting/Sediment Dewatering

Impacted sediment was removed from Williams Ditch between early December 1998 and mid-February 1999. A ditch by-pass system, incorporating two 12-inch pumps and an 18-inch diameter, butt-fused high density polyethylene pipe, was installed in October and November 1998. The by-pass system had the capacity to transfer approximately 12,000 gallons per minute. A series of clay dams, using pre-characterized imported clay, were constructed along Williams Ditch to isolate discrete sections during ditch dewatering and sediment removal. After an individual section of Williams Ditch had been remedied, the previous downstream dam became the new upstream dam and a new downstream dam was constructed. Water removed during the dewatering process was either passed through the on-site water treatment plant or transferred into the downstream section of the ditch, upstream of a siphon dam.

Due to unexpected oil or oil sheen seepage into the sediment management area from a storm sewer that services Arco Drive south of Williams Ditch, direct by-pass of water around the entire work area was not possible during the project. Section 2.4.3.1 describes in more detail the options considered and the remedy implemented to address this seepage. Intermediate discharge points along the by-pass piping were added to allow discharge of water upstream of existing siphon dams. This proved effective in containing any sheen. As a redundant sheen containment measure, a third siphon dam, at the downstream edge of the remediation limits, was constructed in January 1999. Treated water from the on-site water treatment plant was released upstream of a third siphon dam. Treated water was released upstream of the second siphon dam until the third one was built.

The on-site water treatment plant consisted of the following components (listed in order of configuration):

- Two (2) 50,000 gallon contact water storage pools with double liners.
- Two (2) bag filters.
- One (1) sand filter.
- Two (2) bag filters.
- Two (2) carbon cells (one primary and one backup).
- Two (2) 50,000 gallon treated water storage pools.

Treated water was discharged into Williams Ditch, downstream of the sediment removal limits, but upstream of the last siphon dam. Monitoring of the discharge was done in accordance with protocols approved by the Ohio Environmental Protection Agency (OEPA). IT estimates that approximately 700,000 gallons of water from Williams Ditch, decontamination procedures, and stormwater were treated. Effluent was sampled by KMC prior to discharge and the results provided to the Ohio EPA. A summary table of analytical results are provided in Appendix D-4. Several photos of the water treatment plant are found in Appendix C.

2.3.2 Sediment Management

Prior to IT mobilizing to the site, laboratory tests conducted by PDC for waste characterization and handling indicated that the sediment, without dewatering, would not pass the standard paint filter test. Prior to mobilization, IT planned to investigate the following sediment conditioning approaches:

- In-situ air drying/dewatering (Pump around the work area and actively dewater).
- Soil bulking (Mix the sediment with dry soil from the lagoon).
- Solidification with reagents (lime, lime kiln dust (LKD), etc.).

Due to site conditions, the first two (2) approaches proved to be ineffective. IT established a soil conditioning program to determine the optimum reagent and reagent concentration. IT selected various reagents (e.g., lime, LKD, cement kiln dust, etc.) for the optimization tests. IT mixed a standard quantity of ditch sediment with various reagents in proportions (e.g., 10% - 20%) recommended by the supplier. The material was mixed thoroughly and allowed to react. After waiting 24-hours, IT performed the paint filter test on each sample. All of the initial sample trials failed the paint filter test.

IT then increased the reagent proportions during the second round of tests. The minimum concentration of LKD to properly condition the sediment was determined to be approximately 20%. Sediments were allowed to air dry in the ditch prior to the introduction of LKD. Several methods of mixing were used, including placing LKD directly into dewatered sections of Williams Ditch and adding LKD to dewatered sediment in a roll-off box next to the work area. Both methods were effective and for the sake of expediency (and where access allowed it), LKD was added directly to the sediment in the ditch. After the sediments and the LKD were mixed, the mixture was allowed to air dry on the soil staging area north of Frenchmens Road. IT confirmed that the sediment demonstrated an unconfined compressive strength of 2 TSF in accordance with the requirements of Title 35 of the Illinois Environmental Protection Act, Subpart c 729.310 (b)(3) prior to shipment to PDC.

Impacted sediment was removed from approximately 1200 linear feet of Williams Ditch beginning on the east side of Arco Drive and terminating halfway between sample locations SED-009 and SED-010 (referring to the May 1998, sediment sampling event locations). Pre-sediment removal surveys at eleven (11) points along Williams Ditch showed an average top of sediment elevation of 617.2. Survey data collected prior to restoring Williams Ditch indicated an average ditch bottom elevation of 611.1. Sediment depths ranges from 4 to 5 feet at Arco Drive and the first bend in Williams Ditch to 2 to 3 feet thick nearer the terminus. The heaviest creosote related contamination was observed between Arco Drive and approximately station 4+50, just past the second bend downstream of Arco Drive. Once sediment was removed from Williams Ditch, the outfall into Williams Ditch of a 27-inch concrete sewer approximately 150 feet downstream of Arco Drive was exposed, revealing a conduit one-third to one-half full of dark colored viscous material. This outfall was previously not observed as it was covered by sediment and vegetation. Additional discussion of infrastructure restoration, including storm sewers, is included in Section 2.4

Confirmation of sediment removal was made using a combination of visual observation and field fluorescence techniques. Visual observation was adequate to determine when impacted sediment had been removed as a competent clayey soil unit was encountered beneath the sediment. The application of fluorescence techniques corroborated the visual determination. Some seepage of suspected creosote product from the bottom of Williams Ditch, from discontinuous lenses, was observed approximately 240 feet upstream of the remediation area terminous. This location corresponded to the approximate location where the original Williams Ditch intersected the existing location. The effected area at the inner bend of present day Williams Ditch, was over-excavated approximately 2-3 feet into the bottom of the ditch bank to a point where seeps were no longer visible within the clayey soil. This was the only location in the bottom of Williams Ditch where this occurrence was noted after sediment was removed. Pre- and post-sediment removal conditions are shown in the project photodocumentation in Appendix C. Based on estimates provided by IT, approximately 8,944 tons of sediment, LKD and clay dam material were disposed of at PDC's Peoria #1 Subtitle C facility.

Imported clay soils, used to construct containment and siphon dams were managed consistent with the established protocol for characterizing wastes. External portions of these structures, where impact of contaminated sediment was visually apparent, were loaded out and shipped to PDC. Remaining materials were chemically characterized and managed according to the established waste management protocol. A description of the protocol is found in Section 2.6.

2.3.3 Post-Sediment Removal Sampling

After contaminated sediment had been removed and prior to restoring the remediated Williams Ditch, 9 samples, from the banks and bottom of Williams Ditch, were collected and analyzed for PAHs, BTEX and metals. These data were not collected as confirmatory sampling, but rather in anticipation of conducting risk analyses during the EE/CA. The locations of these samples corresponded, in general, with sampling locations used during the initial site characterization by KMC in spring 1998. The locations are shown on Figure 4 and the data tabulated on Table 3. Laboratory results are included in Appendix D-5.

2.3.4 Restoration of Williams Ditch

Consistent with the provisions of the UAO, an engineering control was installed following removal of impacted sediment to prevent any release of creosote related compounds to the water of Williams

Ditch. Approximately 1020 feet of Williams Ditch, beginning on the east side of Arco Drive, were enclosed using a 74-inch inside diameter HDPE profile pipe. Precipitating the need for additional measures were isolated instances of suspected creosote seepage from the northern and western banks of Williams Ditch, between Arco Drive and approximately station 4+10 (refer to Plate A-3 for reference). Additional seepage, from discontinuous pockets or lenses was observed along the northern bank between approximately 6+75 to 8+25 and along the southern bank between approximately 6+25 and 7+50. Additional limited excavation, approximately 6 inches to 2 feet into the ditch bank at several locations was performed to assess the distribution of suspect creosote "pockets". Geoprobe borings were installed along the northern and western sides of Williams Ditch, where accessible, to evaluate the distribution of potential sources of the seepage. While excavation into the bank produced some additional limited seepage, the Geoprobe borings that are beyond the northern top of bank, did not detect any creosote related contamination. This is discussed in more detail in Section 3.0. A typical photographic example of these seeps is included in Appendix C. KMC discussed options with the US EPA during a meeting on January 26, 1999 and subsequent telephone discussions. Options considered were:

- Excavate and remove creosote "pockets".
- Sheet piling.
- Line ditch (Flexible membrane liner, clay, concrete).
- Enclose Williams Ditch.

The selected option was to enclose Williams Ditch. This option provide the greatest long-term effectiveness in preventing potential migration of creosote to Williams Ditch, it could be implemented using proven materials and construction techniques, and had the least amount of uncertainty. Uncertainty regarding the total distribution of contamination contributing to the seeps, long-term effectiveness, constructability and maintenance considerations were the key contributing factors in excluding the other options. A conceptual plan was presented to the US EPA, followed by numerous discussions with City of Toledo Department of Public Utilities and ultimately, a final design was submitted to the US EPA in April 1999. The engineering control plan was accepted by the US EPA on April 28, 1999 and preparation for implementation of the plan began immediately.

A key component of the plan included grading the ditch bottom and placing granular fill beneath and around the 74-inch HDPE pipe such that any residual seepage into the ditch could be captured and conveyed to a single collection point. The details of the monitoring sump and the record drawing of the pipe layout are shown on Plates A-3 and A-5 respectively. Automated measuring devices, tied to an autodialer will alert KMC to the presence of either excessively high water or creosote product (dense non-aqueous phase liquid-DNAPL) in the monitoring sump.

Joints of the 74-inch pipe were extrusion welded using HDPE resin on the inside and an external coupling, using nitrile gasket material and stainless steel bands on the outside. Connection details are shown on Plate A-6 and photodocumentation is provided in Appendix C. Each joint was tested using a specially fabricated instrument to measure pressure loss across the seam to confirm the integrity of the connection. The pipe installer confirmed each joint connection.

Pursuant to requests by the City of Toledo, manholes to access the 74-inch pipe were placed approximately every 300 feet along the length of the pipe. These access points are locked to prevent unauthorized access. In addition, trash racks across both the upstream and downstream ends of the pipe were installed at the request of the City of Toledo as an added safety measure.

2.4 Infrastructure Restoration.

Removal actions at the site required disruption of the infrastructure of the site, including electric, gas, telephone, water, storm sewers and Frenchmens Road. A brief discussion of each is provided in the following sections.

2.4.1 Electric, Gas, and Telephone

Columbia Gas' 4-inch low pressure gas line that serviced 3227 Frenchmens Road was removed and replaced with a new service which entered the property along the eastern edge of the parking lot, outside the limits of the work area. The new service was placed at a depth of approximately 24 inches and no evidence of creosote related contamination was observed. A gas transmission line was reinstalled in approximately its original position along the northern side of Frenchmens Road in October 1999.

Electric poles and underground telephone service were removed and relocated temporarily to facilitate the excavation of the former lagoon area and sediment removal from Williams Ditch.

2.4.2 Waterline

Plans were reviewed by the City of Toledo Department of Public Utilities for consistency with city specifications prior to initiating removal actions at the site. The City of Toledo dictated where new values were to be installed and expressed their preference for removal and replacement of effected portions of the waterline. An 8-inch diameter ductile iron water pipe, which traversed the site along the south side of Frenchmens Road, was removed and replaced during the removal action. The original water line was encountered at a depth of approximately 8 feet below grade and had been installed directly into the underlying clayey soil unit. No granular backfill was observed around the pipe and limited seepage from the underlying clay layer was observed during removal of the waterline. During the removal of the original water line, each end was cut. A new valve was installed at the eastern end in November 1998. The ends of the active line were capped with a steel plate, blocked with concrete and covered with clay. At the eastern end of the site where the new waterline valve was installed, creosote product was observed as a thin "ribbon" resting just above the continuous clayey soil layer at a depth of approximately 3.5 to 4 feet. At the western end of the site, creosote was not observed entering the waterline excavation. A new valve was installed at the western end of the site during the waterline reinstallation in April 1999. The location and profile of the waterline are shown on Plate A-7.

2.4.3 Stormwater Management System

Reinforced concrete pipe storm sewers, in diameters ranging from 12 to 27 inches were encountered within and adjacent to the former lagoon area. To fulfill the objectives of the UAO, it was necessary to remove, replace and restore several of them. The location of each storm sewer affected by the removal action and the corresponding action taken on it is shown on Plate A-3. A brief description of the stormwater management system components affected by the removal action follows:

2.4.3.1 Arco Drive Storm Sewers

While installing the Williams Ditch bypass system, free product was observed flowing into the upstream limits of the sediment management area via the 36-inch storm sewer that services Arco Drive south of Williams Ditch. This was documented after sediment had been removed from immediately east of the twin 48-inch culverts carrying Williams Ditch flow under Arco Drive and the pipes were exposed. The storm sewer, extending south past the Ohio Lottery Commission building at 307 Arco Drive, was cleaned and videotaped to document the condition. Based on the videotape, sections of the Arco Drive storm sewer system were identified as potential avenues of infiltration. Seepage and evidence of past seepage were observed at pipe joints and through lift holes in the top of the pipe. A copy of the sewer inspection report is found in Appendix E.

As a result, three options were developed to address these sections:

- Replace the existing RCP system.
- Remove existing system and replace with HDPE system.
- Use an in-situ method to prevent infiltration.

Use of an in-situ method was selected based on likely acceptance by the City of Toledo, long-term effectiveness, initial excavation requirements and constructability issues. Sliplining was the selected method of implementation for rehabilitation as it generates the least amount of potential waste and disruption to traffic along Arco Drive.

2.4.3.2 Frenchmens Road Storm Sewers

Record information regarding storm sewer replacement and rehabilitation along Frenchmens Road is provided on Plate A-7. Similar to the storm sewer along Arco Drive, south of Williams Ditch, storm sewers which were designated to remain in place along Frenchmens Road were identified as a potential pathway for product migration to Williams Ditch. A copy of the November 1998 inspection report is found in Appendix E. During removal of approximately 230 feet of 24-and 27-inch concrete sewer pipe along the south side of Frenchmens Road and extending to the original outfall into Williams Ditch, water and impacted sediment and creosote product were observed inside the conduit. It is estimated that this sewer's hydraulic capacity may have been reduced by as much as one-third due to accumulated sediment and/or product. This observation confirmed the hypothesis this was a primary migration pathway of creosote related contamination into Williams Ditch and that removal and replacement of this conduit would fulfill the objectives of the removal actions required by the UAO.

The three options considered to address sewers along Frenchmens Road were the same as for Arco Drive. A combination of replacement with HDPE and in-situ rehabilitation was selected. Sliplining was the selected method of implementation for rehabilitation of the 24-inch and 12-inch storm sewers as this approach would minimize potential waste generation and could be performed with minimal disruption to the flow of waste transport trucks entering and leaving the site. Butt-fusion welding was the joining method selected for the new section of 27-inch HDPE pipe. This material and installation method were selected because of the superior long-term effectiveness in preventing infiltration and chemical compatibility versus reinforced concrete pipe. The City of Toledo reviewed hydraulic calculations for the restored storm water management system and concurred with the use of HDPE pipe in this application. The City did however require that the manholes and catch basins remain concrete. A coating of waterproofing was applied inside and out to "seal" these structures against possible seepage of creosote, which was deemed acceptable by the US EPA in their April 28, 1999, approval letter.

Granular backfill was placed around the new storm sewer sections in accordance with City of Toledo specifications. The new section of 27-inch HDPE pipe from Frenchmens Road was directly connected to the 74- inch HDPE pipe used to enclose Williams Ditch. This approach completed a watertight seal along the entirety of the restored Frenchmens Road stormwater system. Granular backfill connected directly to granular material placed around the 74-inch pipe in Williams Ditch provides a mechanism for capturing and conveying any residual creosote to the monitoring sump behind the building at 3226 Frenchmens Road. Photos in Appendix C document the construction of this sump.

A 36-inch reinforced concrete storm sewer, runs north from Frenchmens Road to Williams Ditch between 3226 and 3206 Frenchmens Road. This is shown on Plates A-1 and A-3. As the cleaning and video inspection of this sewer did not identify infiltration of source material, the pipe was not modified, other than rehabilitation of the two catch basins on Frenchmens Road. Documentation of this inspection is provided in Appendix E. Details of the connection to the 74-inch HDPE pipe in Williams Ditch are shown on Plate A-6. Similarly, a 21- inch concrete storm sewer entered Williams Ditch from the east at approximate station 9+55 and a watertight connection made to the 74-inch HDPE pipe. Each connection used a length of HDPE fusion welded to an opening cut in the 74-inch HDPE pipe and grouted into place on the RCP outlet.

2.4.4 Road Replacement and Removal

Approximately 260 feet of Frenchmens Road was completely removed and replaced during the excavation of the former lagoon area. Asphalt and subbase material were stockpiled separately. This material was disposed of off-site according to results of chemical analysis, conducted in accordance with the waste characterization protocol established for the site. If it was unclear whether the subbase material was impacted, it was placed in the waste staging pile for transportation to PDC.

An additional 240 feet of Frenchmens Road was resurfaced due to its deteriorated condition. The limits of the Frenchmens Road restoration are shown on Plates A-7 and A-8.

2.5 Air Sampling

Air sampling was conducted according to the protocol described in the Site's Health & Safety Plan. The Ohio Department of Health was consulted during the start up of the project and kept informed during the project of air sampling results. A total of 219 air samples from upwind, downwind and personal locations were collected and analyzed for benzene and naphthalene. The average detected benzene concentration was 3.4 ppb, which was below the ODH recommended monitoring level of 5.5 ppb (4 ppb plus background). The average detected naphtalene concentration was 18.9 ppb, which although it exceeded the ODH recommended monitoring level of 8 ppb, a one-time spike of 147 ppb skewed the average. The peak naphthalene result was however below the acute minimum risk level (MRL) and the ODH confirmed this peak would not trigger public health concerns. Air samples were collected during soil and sediment removal activities, as well as during load out of waste staged on the pad. IT's Site Health and Safety Officer was responsible for conducting the sampling and KMC periodically conducted additional sampling as a quality assurance measure. A complete tabulation of air sampling results obtained during the removal action are included in Appendix D-6.

2.6 Waste Management Protocol

Excavated soil from the lagoon areas was initially segregated by its level of visual contamination pursuant to the Section 4.1.1 of the Time Critical Removal Plan, August 1998. Soils were segregated into three categories:

1. "Clean" soils were defined as surficial soils with no visible contamination, either in the form of free flowing, creosote product or dark colored pieces of hard material.

2. “Questionable” soils, underlying the “clean” soils were darker, sandy silty soils, containing occasional dark colored pieces of hard material suspected of being either coal or hardened creosote.

3. Waste materials were defined as sandy, silty or clayey soils visibly saturated with creosote (such that it would be visible on gloves or booties) or free flowing, creosote product. Observations during two test pit excavations conducted immediately prior to beginning excavation activities confirmed this typical vertical profile. DNAPL was observed as a thin band or seam resting on an underlying clayey soil layer, where there was distinct difference in the geotechnical characteristics of the stratum.

Discussions between KMC and the US EPA regarding the appropriate characterization and management of the "clean" and "questionable" soil piles occurred between December 1998 and March 1999. Several meetings, conference calls and exchanges of correspondence occurred relative to this matter. The US EPA, ultimately determined that the generic direct contact standards developed for Ohio's Voluntary Action Program (VAP) were to be used as a site specific health-based screening level, below which a contaminated media would no longer be considered to contain hazardous waste. It was not specified whether an industrial or commercial scenario was to be applied. Appropriate analytical sampling was conducted to characterize materials that did not immediately fall into a waste category using this protocol. A flow chart outlining the waste characterization and analytical results on soil materials generated during the removal action are included in Appendix D-7. Table 4 summarizes the analytical testing performed on the various stockpiles of material. Table 5 summarizes the quantities and disposition of waste materials including soils, sediment and non-hazardous materials. Appendices F-1 to F-4 contain copies of manifests of materials disposed of off-site.

2.7 Effectiveness of the Removal Actions

The effectiveness of the removal actions, described in Sections 2.1 to 2.5 taken by KMC in response to the UAO, is demonstrated by the current condition of the Site following implementation of the Time Critical Work Plan. Significant quantities of creosote impacted sediments were removed from Williams Ditch, thus reducing the potential exposure to nearby human populations, animals or the food chain, and visually improving the water quality. The threat of potential exposure to creosote impacted sediments has been mitigated by removing the sediments and enclosing the portion of the ditch, that based on existing data, posed the greatest potential risk to human health and the environment. Subsequent to the remediation of Williams Ditch, there has been no evidence of oil or oil sheen on the water surface downstream of the site. Photodocumentation of before and after conditions is provided in Appendix C.

The potential for migration of creosote related contamination to Williams Ditch and the surface of Frenchmens Road has been reduced significantly compared to pre-removal conditions through the implementation of source removal, pathway mitigation and engineering controls. The removal actions mitigate the potential for weather conditions to exacerbate the migration of creosote related contaminants to Williams Ditch because the entire stormwater management system within the limits of the work area has been isolated from any residual creosote contamination. The use of HDPE materials allowed joints, connections and appurtenances to be sealed, effectively reducing the potential for infiltration.

Upon backfilling excavated areas with clean off-site soil, spreading a minimum of 2 inches of clean topsoil across the entire disturbed area and revegetating, the potential for direct contact with surficial soils, which may remain contaminated with PAH's by incidental users of the site, is substantially reduced. The imminent and substantial endangerment to the public health, welfare or the environment has been mitigated.

2.8 Difficulties Encountered

Pursuant to 40 CFR § 300.165(c)(3), the following is a list of difficulties or challenges encountered during the time critical removal action that affected the response. For the sake of brevity, only those that directly affected the scope, magnitude or duration of the response are noted:

1. Coordination of utility relocation at the beginning of the removal actions conducted pursuant to the Time Critical Removal Plan, August, 1998. Delays on the part of utility companies created logistic difficulties for IT at the outset of the project, setting back the initiation of excavation activities approximately 3 to 4 weeks.

2. The discovery, during implementation of the removal actions, of previously undetected sources of creosote migration to Williams Ditch. This discovery created logistical difficulties for IT with the anticipated flow of the project and expanded the scope of work significantly by requiring additional investigative and engineering efforts, beyond that described in the Time Critical Removal Plan, to fulfill the objectives of the UAO. In addition, the level of effort required by IT to complete the project was increased, thus extending the duration of the work. Delays in material delivery and coordination with the local unit of government regarding infrastructure also affected the schedule.

3. The May 12, 1999, expiration of the LDR exemption for F034 waste complicated the removal action by creating an additional encumbrance on KMC and IT by imposing constraints on the order of project activities, increasing project costs, and extending project duration due to the time required to complete transportation and disposal arrangements for post-LDR materials. Approximately 590 tons of material were treated and disposed of post May 12, 1999.

4. Not being allowed to reuse surficial soils not considered source material, as originally presented in the Time Critical Removal Plan, August 1998, created logistical difficulties for IT, substantially altered the expected scope of work, extended the project duration and increased project costs.

3.0 DISCUSSION OF RESIDUAL CONTAMINATION

Plates A-4a and A-4b show the location of all test pits, test trenches, Cone Penetrometer Test (CPT) holes, and Geoprobe borings conducted during the time critical removal action. This representation is significant because it illustrates the distribution of remaining creosote related contamination after completion of time critical removal activities, within the area investigated during April and May 1998. Observations of site conditions documented during removal activities provide additional data that can be considered during the EE/CA. Table 6 summarizes these observations and their relevance to the objectives of the time critical removal.

In general, within the excavation limits presented in the Time Critical Removal Plan, it is likely that, in some locations, residual creosote contamination, in the form of discontinuous and isolated globules, typically pinpoint sized, remains within the underlying clayey soil layer. This is described in the modification to the Time Critical Removal Work Plan, August, 1998, made by the US EPA in a letter dated April 15, 1999. The frequency and intensity of this phenomenon decreases with depth, down to around 8 feet below grade. Comparison of survey data following source removal to the approximate depth of the LIF signature suggests that, on average, the remaining thickness of soil containing these globules is, on average, 6 to 18 inches. The typical profile in areas north of the former lagoon area, within the area identified as having an LIF signature above background, was brown sandy, silty soil down to approximately 3.5 to 4 feet below grade, at which point a grey clayey silt material was encountered. The grey clayey silt unit transitioned into a medium stiff to firm grey clayey soil unit. Discontinuous and isolated globules of suspected creosote, ranging in size from pinpoints to quarter sized were observed at this depth. These globules tended to seep for a short while when first exposed, but then after the capillary pressure was dissipated, they tended to stop flowing. It was observed, in general, that the occurrence of these isolated globules decreased with depth. These observations correlate fairly well with the LIF signature obtained during the May 1998 investigations.

4.0 GOOD FAITH COST ESTIMATE

Table 7 summarizes the costs incurred by KMC to fulfill the requirements of Section V, Items 3.1) through 3.7) of the UAO. These costs reflect contracting, engineering, project support, legal, disposal fees, analytical services and utility relocation fees from the effective date of the UAO through December 31, 1999. The cost should be considered an estimate as billing periods vary and invoices may contain costs outside the window KMC considers to be the time critical removal action. The data used to generate these costs were retrieved from KMC's accounting system database.